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Comparing SeaWiFS Reprocessing Versions (R3 vs. R4)

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ABSTRACT

Satellite observations of global ocean chlorophyll from SeaWiFS were recently reprocessed to incorporate calibration and algorithm improvements. Here, comparisons are made between the newly reprocessed SeaWiFS Level-3 chlorophyll product and the previous version using in situ measurements. The results show that the newly reprocessed SeaWiFS data matches up better with the surface measurements than the previous version did. Globally, the slope of the match-ups improves to 0.85 from 0.78 in log-log scale. A significant trend that contributed to this improvement was the overall decrease in SeaWiFS chlorophyll levels less than 1.0 mg m^{-3}. Regional analyses reveal that the match-ups improve in every oceanic basin, except the Antarctic. However, SeaWiFS continues to exhibit poor correspondence with in situ data in the North Atlantic where the match-ups have a slope of 0.54. Also, an examination of monthly images for May 1999 revealed that the number and magnitude of high-value chlorophyll pixels had increased in the high-latitude open ocean of the South Pacific.

1. INTRODUCTION

Obtaining accurate measurements of chlorophyll concentration in the world's oceans is critical to our understanding of many biogeochemical processes. Chlorophyll is the green photosynthetic pigment in microscopic plants called pyhtoplankton. Through photosynthesis, phytoplankton play an important role in the Earth's carbon cycle and may mitigate global warming by transferring heat-absorbing carbon dioxide from the atmosphere back into the biosphere.

Satellite observations from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) have provided a continuous record of global ocean chlorophyll since September 1997. The near-global coverage and continuity of the SeaWiFS record permit observations of the spatial variability of phytoplankton through time, especially on seasonal and interannual timescales, and therefore, has vastly improved the capacity for modeling primary productivity and the carbon cycle.

Recently, SeaWiFS data was reprocessed to incorporate calibration and algorithm improvements. This study examines the newly reprocessed SeaWiFS product by comparing it to the previous version and utilizing in situ measurements to highlight differences.

4. CONCLUSIONS

The R4 SeaWiFS SMI chlorophyll values generally match up better with the SeaBASS in situ measurements than the R3 data set. Improvement can be seen in almost every oceanic region, except the Antarctic. However, while the match-ups improve, SeaWiFS continues to have some trouble in coastal areas, such as the North Atlantic (particularly off the coast of New England). A significant trend which improved the in situ match-ups was the overall decrease in chlorophyll levels less than 1.0 mg m^{-3}.

An examination of monthly images for May 1999 revealed that the number of high-value chlorophyll pixels had increased with R4 over R3. While outliers were present in monthly R3 SeaWiFS mapped images, it is clear that the incidence and magnitude of high outliers has increased with the R4 reprocessing in the high-latitude open ocean of the South Pacific.

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